

CLAIMS

What is claimed is:

1. A method for establishing a virtual path within a frame relay network wherein frames are transmitted over a plurality of virtual circuits from a first switching node to a second switching node, said methods comprising:

transmitting by said first switching node to said second switching node, a first control message requesting a virtual path be established, and specifying two or more virtual circuits to be combined to form said virtual path;

receiving a frame, at said second switching node, wherein said frame has an identifier corresponding to said virtual path; and

forwarding said frame, utilizing said second switching node, to a destination determined based on said two or more said virtual circuits specified in said first control message.

2. The methods of claim 1, wherein said step of transmitting said first control message includes the step of handling a data link connection identifier, corresponding to a predetermined value, for identifying said purpose of first control message.

1 3. The method of claim 1, wherein said step of
2 transmitting said first control message includes the step
3 of transmitting a field for identifying each of said two
4 or more said virtual circuits.

1 4. The method of claim 1, wherein said step of
2 transmitting said first control message includes the step
3 of transmitting information specifying said virtual path,
4 wherein said information is comprised of:

5 a source virtual circuit identifier, which
6 corresponds to an input adapter of said first switching
7 node;

8 a source port identifier, which corresponds to an
9 input port of said first switching node;

10 a destination virtual circuit identifier, which
11 corresponds to an output adapter of said second switching
12 node; and

13 a destination port identifier, which corresponds to
14 an output port of said second switching node.

1 5. The method of claim 1, further comprising the step
2 of:

3 transmitting by said second switching node to said
4 first switching node, a second control message conveying
5 acknowledgment of said request to establish said virtual

6 path or rejection of said request to establish said
7 virtual path.

1 6. The method of claim 5, further comprising the step
2 of:

3 transmitting to said first switching node to said
4 second switching node, a third control message
5 acknowledging a reception of said second control message
6 by said first switching node.

1 7. The method of claim 1, further comprising the step
2 of:

3 starting a timeout timer, by said first switching
4 node, when said first control message is transmitted;

5 detecting an error when said timeout timer expires
6 prior to receiving a second control message from said
7 second switching node, wherein said second control
8 message conveys acknowledgment of said request to
9 establish said virtual path or rejection of said request
10 to establish said virtual path.
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1 8. The method of claim 1, further comprising the step
2 of:

3 transmitting to said second switching node, a forth
4 control message, sent by said first switching network,

5 for removing one of said two or more virtual circuits
6 from said virtual path.

1 9. The method of claim 1, further comprising the step
2 of:

3 transmitting to said second switching, a fifth
4 control message, sent by said first switching network,
5 for canceling said virtual path.

10. The method of claim 8, further comprising the step
of:

starting a plurality of activities timers, wherein
each of said two or more virtual circuits combined to
form said virtual path corresponds to one of said
activities timers;

resetting, for each frame received for said two or
more virtual circuits combined to form said virtual path,
the corresponding said activity-timer;

detecting, by the expiration of one of said
activity-timers, an extended period of non-activity by
one of said virtual circuits which correspond to said
expired activity-timer; and

15 transmitting to said second switching node, a forth
16 control message, sent by said first switching network,
17 for removing from said virtual path, said virtual circuit
18 corresponding to said expired activity-timer.

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1 11. A system for establishing a virtual path within a
2 frame relay, said system comprising:

3 a frame relay network including a plurality of
4 virtual circuits for transmitting frames from a first
5 switching node to a second switching node;

6 a virtual path established by a first control
7 message transmitted by said first switching node to said
8 second switching node, defining a virtual path, and
9 specifying two or more virtual circuits to be combined to
10 form said virtual path;

11 a frame, having an identifier corresponding to said
12 defined virtual path, received by said second switching
13 node and then forward said frame to a destination
14 determined by said two or more virtual circuits specified
15 in said control message.

1 12. The system of claim 11, wherein said control message
2 includes a data link connection identifier, corresponding
3 to a predetermined value, for identifying said purpose of
4 first control message.

1 13. The system of claim 11, wherein said control message
2 includes a field for identifying each of said two or more
3 virtual circuits.

1 14. The system of claim 11, wherein said first control
2 message includes information specifying said virtual
3 path, wherein said information is comprised of:

4 a source virtual circuit identifier, which
5 corresponds to the input adapter of said first switching
6 node;

7 a source port identifier, which corresponds to the
8 input port of said first switching node;

9 a destination virtual circuit identifier, which
10 corresponds to the output adapter of said second
11 switching node; and

12 a destination port identifier, which corresponds to
13 the output port of said second switching node.

1 15. The system of claim 11, further comprising:

2 a second control message transmitted by said second
3 switching node to said first switching node, conveying
4 acknowledgment of said request to establish said virtual
5 path or rejection of said request to establish said
6 virtual path.

1 16. The system of claim 15, wherein said first switching
2 node is adapted to transmit in response to said second
3 control message, to said second switching node a third
4 control message acknowledging a reception of said second
5 control message by said first switching node.

1 17. The system of claim 11, further comprising:

2 3 a timeout timer, set by said first switching node
4 when said first control message is transmitted;

10 4 detecting an error when said timeout timer expires
5 prior to receiving a second control message from said
6 second switching node, wherein said second control
7 message conveys acknowledgment of said request to
8 establish said virtual path or rejection of said request
9 to establish said virtual path.

1 18. The system of claim 11, further comprising:

2 3 a forth control message transmitted by said first
4 switching node to said second switching node, for
5 removing one of said two or more virtual circuits from
6 said virtual path.

1 19. The method of claim 11, wherein said first switching
2 node is adapted to transmit to said second switching, a
3 fifth control message, for canceling said virtual path.

1 20. The system of claim 18, further comprising:

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3 a plurality of activities timers, wherein one said
4 activities timers corresponds to each of said two or more
5 virtual circuits combined to form said virtual path,
6 wherein for each frame received for said two or more
7 virtual circuits combined to form said virtual path, said
8 corresponding said activity-timer is reset;

9
10 an error condition signal, wherein said error
11 condition signal is generated from the detection by the
12 expiration of one of said activity-timers, an extended
13 period of non-activity by one of said virtual circuits
14 which correspond to said expired activity-timer; and

15 a forth control message, sent by said first
16 switching network in response to said error condition
17 signal, for removing from said virtual path, said virtual
18 circuit corresponding to said expired activity-timer.